

WHAT IS CLAIMED IS:

1. An osteogenic paste composition effective for the induction of new bone growth in a primate, comprising:

- 5 a resorbable paste carrier;
an osteogenic factor; and
a porous particulate mineral in an amount of at least 20% by volume of the composition, said amount being effective to provide a scaffold for bone ingrowth as the resorbable paste carrier is resorbed.

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2. The composition of claim 1 which further comprises demineralized bone matrix.

3. The composition of claim 2 wherein the ratio of
15 demineralized bone matrix to resorbable carrier is between about 1:4 and about 3:2 by weight.

4. The composition of claim 2 wherein the composition comprises 5-45% by weight resorbable carrier.

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5. The composition of claim 1 wherein the resorbable carrier is flowable at temperatures above the body temperature of the mammal, but transitions to a non-flowable mass at or slightly above said body temperature.

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6. The composition of claim 1 wherein the mineral is selected from the group consisting of bone particles, bioglass, tricalcium phosphate, hydroxyapatite, corraline hydroxyapatite, biocompatible ceramic and non-resorbable biocompatible organic polymer.

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7. The composition of claim 1 wherein the mineral comprises tricalcium phosphate, biphasic calcium phosphate, or hydroxyapatite particles having an average particle diameter of about 0.050 to about 5.0 mm.

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8. The composition of claim 1 wherein the mineral comprises mammalian bone particles having a particle size of about 0.050 to about 5.0 mm.

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9. The composition of claim 1 wherein the mineral comprises cortical human bone particles having an average particle diameter of about 0.050 to about 5.0 mm.

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10. The composition of claim 1 wherein the osteogenic factor comprises a bone morphogenic protein selected from BMP-2, BMP-4, BMP-6 or BMP-7, a LIM mineralization protein, or a nucleotide sequence encoding said bone morphogenic protein or LIM mineralization protein.

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11. The composition of claim 1 further comprising one or more osteogenic enhancing factors selected from the group consisting of osteogenic progenitor cells, autographic bone marrow, allographic bone marrow, transforming growth factor-beta, fibroblast growth factor, platelet derived growth factor, insulin-like growth factor, microglobulin-beta, antibiotics, antifungal agents, wetting agents, glycerol, steroids and non-steroidal anti-inflammatory compounds.

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12. The composition of claim 1 wherein the mineral constitutes about 20% to about 80% by volume of the composition.

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13. An osteogenic implant material effective for the induction of new bone growth in a mammal, comprising:

a resorbable paste carrier comprising gelatin, the resorbable carrier formulated to be flowable at temperatures above the body temperature of the mammal, and to transition to a non-flowable mass at said body temperature;

demineralized bone matrix;

an osteogenic factor; and

a particulate mineral having an average particle size of about 0.050 to about 5.0 mm, said mineral constituting at least 20% by volume of said composition.

14. The composition of claim 13 wherein the mineral constitutes about 20% to about 80% by volume of the composition.

15. The composition of claim 13 wherein the mineral comprises human bone particles.

16. The composition of claim 13 wherein the mineral comprises non-human bone particles, said particles having been treated to reduce their immunogenicity in humans.

17. The composition of claim 13 wherein the osteogenic factor is a bone morphogenic protein selected from BMP-2, BMP-4, BMP-6 and BMP-7, a LIM mineralization protein, or a nucleotide sequence encoding said bone morphogenic protein or LIM mineralization protein.

18. A method for inducing bone growth in a primate, comprising implanting in the primate a composition according to claim 1, at a site at which bone growth is desired.

19. The method of claim 18, wherein the site is in the spine of the primate.

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20. The method of claim 19, which is a spinal fusion.

21. The method of claim 20, wherein the spinal fusion is an interbody spinal fusion.

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22. The method of claim 20, which is a posterolateral spinal fusion.

23. The method of claim 19, wherein the primate is a human.

15 24. The method of claim 20, wherein the fusion includes a fusion between transverse processes of adjacent vertebrae.

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25. A method of performing a spinal fusion in a human, comprising implanting between adjacent vertebrae to be fused an effective amount of a composition according to claim 1.

26. The method of claim 25, wherein the composition is implanted in combination with a load bearing device.

25 27. A method for inducing bone growth in a primate, comprising:

heating an effective amount of an osteogenic paste composition to a temperature at which it is flowable, said osteogenic implant material comprising a resorbable paste carrier that is flowable at temperatures above the body temperature of the primate, but which transitions to a non-flowable mass at or slightly above said body temperature; an osteogenic factor that stimulates osteoblasts and osteoclasts; and, a

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particulate mineral effective to provide a scaffold for bone ingrowth as the resorbable carrier is resorbed, said mineral constituting at least 20% by volume of the paste composition;

implanting said osteogenic paste composition at a site of desired
5 new bone formation; and

cooling the osteogenic paste composition to a temperature sufficient to transition the osteogenic paste composition to a non-flowable mass.

10 28. The method of claim 27 wherein the implant material
further comprises demineralized bone matrix.

29. The method of claim 27 wherein the primate is a human.